WORLD DEVELOPMENT

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The North Taps into the South for New Ideas and Technology

SEPTEMBER 1991

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Looking South for Answers

The developing world is offering solutions to many global problems

By Cherie Hart

London, UK — When London's underground trains could no longer cope with heavy commuter traffic, an Indian computer company was called in to overhaul the timetable system. When a non-profit US group began lending money to impoverished inner-city residents, a bank in Bangladesh was used as a model. When a Dutch firm wanted to refine its petroleum processing, it looked to India for a new chemical catalyst.

Increasingly, researchers in the North are linking up with scientists engaged in research and development from Africa, Latin America and Asia. One-tenth of the world's engineers and scientists are from the developing world, and more than a dozen of them have won Nobel prizes in chemistry, physics and medicine.

The flow of new ideas and technologies is still preponderantly North to South. But, the developing world is now becoming recognized as a vast repository of genetic resources vital to the global food system and medical research. An extract from a rosy periwinkle, used by healers in Madagascar, has proven effective in treating childhood leukemia. A new strain of wheat perfected in Mexico increased the value of the crop yields in Australia by US$65 million a year.

Looking ahead, alcohol-powered vehicles, a common sight for the past 15 years in Brazil, could become

Samoan traditional healers share the secrets of the rain forest with ethnobiologist Paul Cox.

Mark Philbrick / Brigham Young University

Herman Lovink

Testing equipment in the processing of catalysts in AKZO Chemicals' Amsterdam plant.

prototypes for Northern car manufacturers by the end of the century. Experiments in solar energy and biomass recycling in developing countries are now extremely relevant to industrialized nations determined to reduce their dependence on imported oil.

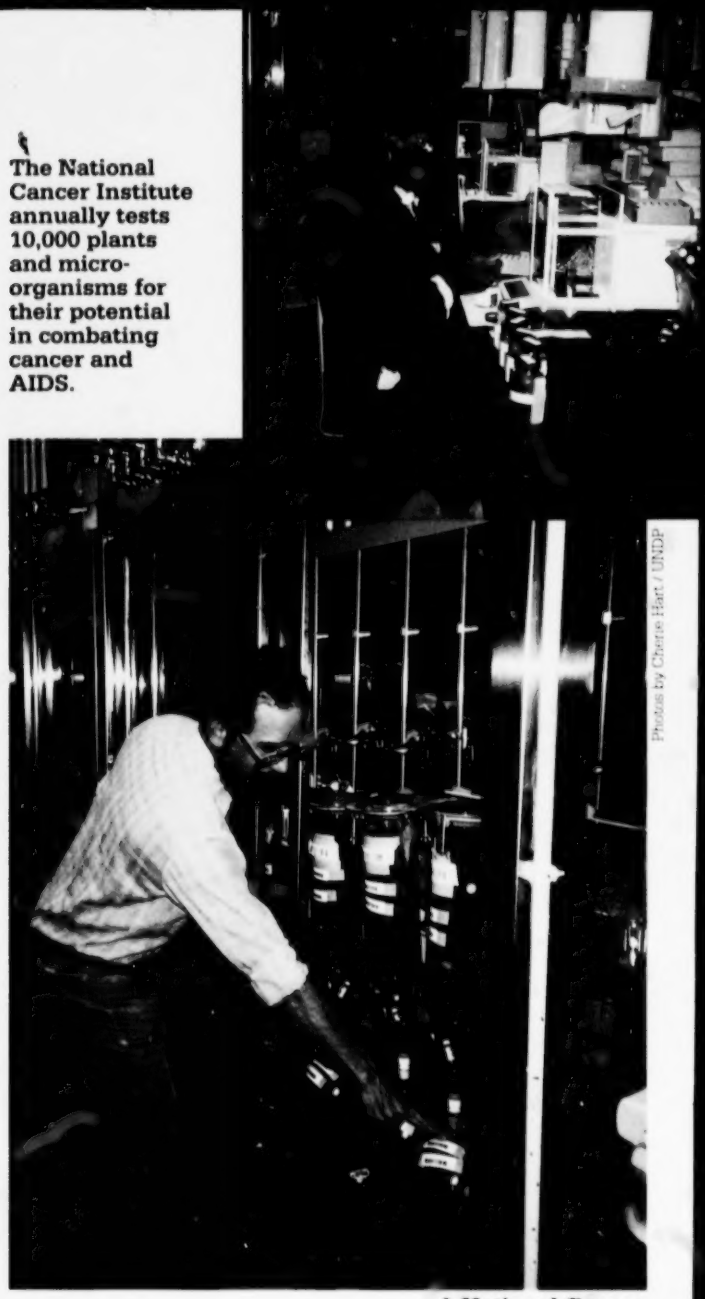
"We are all in the same boat when it comes to tackling global challenges like the greenhouse effect, energy shortages, overpopulation, the AIDS epidemic, debt and drugs," says Jean-Marc Fleury of Canada's International Development Research Centre (IDRC).

"We must tap each other's knowledge and resources," adds Mr. Fleury, who authored an IDRC report called "The Global Research Agenda, A South-North Perspective."

In addition to IDRC, the United Nations Development Programme (UNDP) and other international agencies are actively supporting efforts to bring Southern scientists, researchers and social reformers together with their Northern colleagues.

The IDRC's South-North report cites Brazil, China, India, Mexico and the Republic of Korea as developing countries with advanced scientific and technical capabilities.

Firms in the North are beginning to tap these resources. Amsterdam-based AKZO Chemicals International, for one, sought out an Indian company to devise a key ingredient in a catalyst for refining petroleum. The substance, zeolite, which consists mainly of



The National Cancer Institute annually tests 10,000 plants and micro-organisms for their potential in combating cancer and AIDS.

Photos by Cherie Hart / UNDP

A National Cancer Institute scientist prepares plant and animal specimens from the tropics for experiments.

sand and aluminium, was mixed into a catalytic formula in 1988 at the National Chemical Laboratory in Pune, India. The Laboratory received assistance from the UN Industrial Development Organization and $2 million from UNDP to strengthen research and develop a unit which would produce chemical catalysts. The division flourished.

Today, AKZO Chemicals uses the Laboratory's zeolite formula for numerous industrial purposes, including ridding fuel of elements which can clog engine filters. "We needed a certain kind of zeolite for our oil refining and chemical industries," says Herman Lovink, a senior scientist at AKZO. "The National Chemical Laboratory took up the challenge and came through with just the type of zeolite we needed."

Not all lessons learned from the South come from test tubes and laboratories. More than one-quarter of the industrialized world's medications are plant-based, including tranquilizers, blood-pressure reducers and the raw materials for certain contraceptives. Many such plants are in tropical rain forests.

The Natural Products Branch of the US government's National Cancer Institute is actively searching the developing world for materials that could combat a host of human cancers. Its laboratory annually tests 10,000 plants, marine invertebrates, micro-organisms, algae and fungi to determine their ability to fight 60 human cancer cell strains and the AIDS virus.

The Institute receives roots, leaves and other plant and animal specimens from the oceans and tropical forests of more than 25 countries in Africa, Asia and Latin America. These samples are sent by globe-trotting botanists who work on contract for the Institute.

The hunt for specimens involves much more than collecting leaves and pulling up plants. Whenever possible, tribal healers, who are virtual encyclopaedias of knowledge, are asked to join in the explorations. "We used to view these healers as practitioners of black magic or voodoo," says Gordon Cragg, chief of the Natural Products Branch. "But over the past five years, a more organized study of plants used by these remote practitioners has made us realize how important and immense their knowledge really is."

One goal of the US programme is to draw upon that traditional wisdom before the indigenous folk medicine and the rain forests in which it flourishes are decimated by 20th century development. "We are in a race against time," says Paul Cox of Brigham Young University in Provo, Utah. As an ethnobotanist, Mr. Cox travels to developing countries for up to a year at a time, gathering important specimens for the Natural

Indian Software Goes Underground

By I. Rajeswary

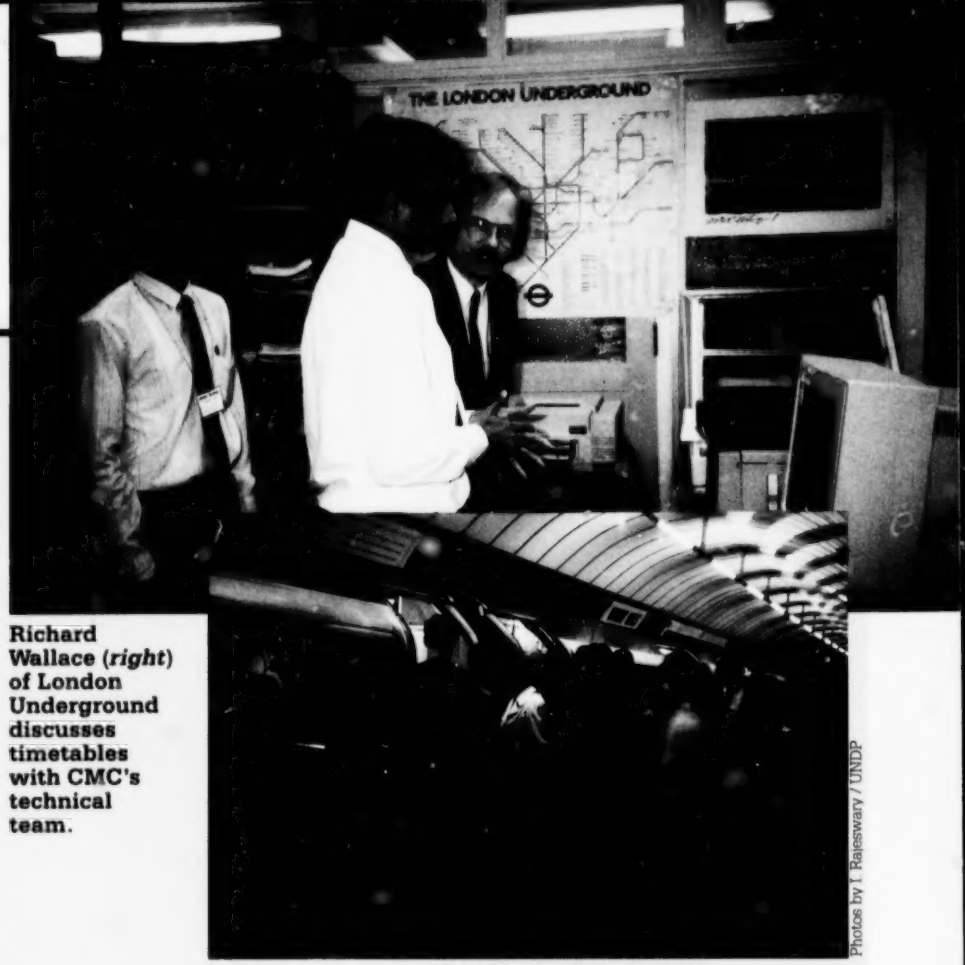
London, UK — Two years ago, London Underground Ltd. turned to CMC Ltd., an Indian computer company, to get its trains to run on time. Based in New Delhi, CMC beat six London firms in a competitive bid for the job. *High Tech Flourishes Amid the Sacred Cows* ran a headline in the British press. Given India's reputation for airline and train delays, some sceptics questioned whether an Indian firm could get 460 trains, criss-crossing each other during rush hour, to run on time. Arun Madan, CMC's European manager admits it was a major task. "But we knew we could do the job," he says, "because we had the expertise."

The 15-year-old company has an impressive history in providing sophisticated computer services. Since 1978, it has offered maintenance support to all IBM users in India. CMC has also designed computer software for railways management, power distribution and weather forecasting for other developing countries.

In fact, with US$3 million from the UN Fund for Science and Technology for Development, which is administered by UNDP, CMC helped customize passenger reservation systems for Indian Railways in Bombay, Calcutta, New Delhi and Madras. The software drastically cut waiting time to buy tickets and reserve seats for any destination, train or class from any ticket window. "We figured that if CMC could sort out Indian Railways," says Richard Wallace, senior project manager of London Underground Ltd., "they could definitely get our scheduling to work."

The previous London tube system was expensive to maintain and not flexible enough to meet present, let alone future, traffic projections. Currently, trains carry nearly 800 million passengers a year. "We were very impressed with CMC," says Mr. Wallace, "because of their willingness to understand our needs. And they were the only ones who proposed a new design."

The CMC technical team spent the first six months of last year in London just investigating and piecing together data on the old system. The group returned to India to design a new timetabling and signalling software programme based on the computer-aided railway timetabling (CART) approach.



Richard Wallace (*right*) of London Underground discusses timetables with CMC's technical team.

Photos by I. Rajeswary / UNDP

London Underground's trains carry nearly 800 million passengers a year.

The CART concept incorporates a massive database that maps each of London's 10 lines and their interconnections. London's previous software was written in the 1960s and the hardware on which it ran became obsolete. The new CMC-designed software package was installed in March. Easier to operate and maintain, it affords greater flexibility and speed in updating train timetables. In the past, it took at least a month to change train schedules. Now, the process can be completed in as little as a few hours and new train lines can be introduced and routed with the punch of a few computer keys.

L. Newel / US Forest Service

A field seminar in American Samoa demonstrates the Philippine's "contour hedgerow" system.

Products Branch. "I believe we have only another 20 years to collect medicinal information from the old tribal healers," he says. "Their language and environment may die before we are able to find out if these old people have the key to curing diseases that have been afflicting mankind for centuries."

Mr. Cox's recent studies of Polynesian plants have turned up a Samoan tree whose extracts showed a potential for killing the AIDS virus in the laboratory. Three other agents tested in the laboratory at the National Cancer Institute, including a tree creeper from Cameroon, have shown a capacity to protect cells from the AIDS virus.

Should any of these extracts eventually be licensed to a pharmaceutical company for production, the Institute will help negotiate the licensing agreement requiring that the company pay a percentage of royalties to the source country.

Food production is another vital area of worldwide concern in which the flow of scientific information travels in all directions. If one were to shop at a supermarket and buy only foods indigenous to the US, the basket would be almost empty. Only a handful of food crops — notably the sunflower, cranberry, and pecan — originated in North America. In fact, developing countries are the source of more than half of the plant genes used in the industrialized countries to produce improved agricultural species.

Forty years ago, there were only two or three international scientific research centres in the developing world. Now, there are more than 200, many aided by UNDP and other UN agencies.

The developed world is also gaining a great deal from the South in the area of agroforestry. This is an agricultural system in which shrubs and trees are grown together with food or cash crops on the same piece of land. Realizing that forestry management techniques developed for North America have limited relevance for the geography and cultures of the tropics, the US Forest Service has turned to the Philippines to assist in its Western Pacific forestry conservation and management programmes. "I would say the Philip-

Borrowing from Banking in Bangladesh

By Lois Jensen

Chicago, US — Though worlds apart, Mary Houghton, an American, and Muhammad Yunus, from Bangladesh, had drawn the same ironic conclusion about their countries' banking systems: In order to borrow money you first needed to have plenty of it.

By providing credit to peasants in Bangladesh, Muhammad Yunus, founder of the Grameen Bank, helped launch hundreds of thousands of entrepreneurs and revolutionized microlending in the developing world. By investing in poor Americans that other banks wouldn't touch, Mary Houghton, executive vice-president of the South Shore Bank in Chicago, helped revive a predominantly black neighbourhood once given up for dead.

Ms. Houghton first met Dr. Yunus in 1983. She and another South Shore Bank colleague had been invited as consultants to Bangladesh to help turn the Grameen Bank "project" into the Grameen Bank. But the close professional relationship that was cemented there, along with the phenomenal success of the Grameen Bank itself, was soon to turn that relationship around. Today, Dr. Yunus is advising groups around the US — indeed, around the world — on adapting his lending model. Recently, the UN Capital Development Fund, which is administered by UNDP, approved funding to train practitioners from 20 least developed countries at the Grameen Bank's headquarters in Dhaka and in branches around th country.

What makes the Grameen model unique is its reliance on peer group pressure and support. If one or more members of a small borrowing group are

Wayne Singleton

Grameen Bank founder Muhammad Yunus with Good Faith borrowers in Arkansas.

behind on repayments, the other members forfeit their loans.

Ms. Houghton says that the idea of transplanting the model to the US took hold five years ago, while driving with Dr. Yunus along vast stretches of highway in rural Arkansas. At the time, the South Shore Bank was involved in setting up an economic development programme there, and the concept of group lending, so successful in Bangladesh, was discussed as one possibility.

When asked his opinion, Dr. Yunus, in his usual style, went straight to potential borrowers themselves. "We spent three or four days driving around small towns in Arkansas asking people what they thought," recalls Ms. Houghton. "It was in those hours of travelling that we really worked out how the Grameen model might work here."

Today the Good Faith Fund, based in Pine Bluff, Arkansas, uses group lending practices pioneered in Bangladesh. In the inner-city of Chicago, the Women's Self-Employment Project, which Ms. Houghton helped found, has made micro-loans totalling more than US$48,000 to 54 low and middle-income women, using the Grameen model. The recovery rate is 100 per cent.

While the Grameen model has encountered difficulties in the US, including high overhead costs, the concept is compelling enough that as many as 20 programmes have taken root here. It has helped women like Chicagoan Gloria Davis, who makes custom T-shirts, to open her own shop. In Arkansas, Dorothy Quarles, who worked most of her life as a cook in other people's homes, is now fulfilling a life-long dream of running her own catering business.

With continued support from the Ford Foundation, those involved in the women's project in Chicago and other programmes here in the US are being encouraged to share their experiences. A Ford Foundation grant is also enabling Dr. Yunus and Bangladeshi colleagues to revisit the US to help adapt and change the model they first initiated.

Already, the Grameen experience has deeply touched many who have visited Bangladesh. "What Dr. Yunus and his colleagues challenged me to do," says former Ford Foundation staffer Susan Davis, who spent four years in Bangladesh, "was to go back and really *listen* to the problems of the poor — right here in my own country."

Leonardo Escobar, (*2nd from right*) talks to street people in Washington, DC.

Chris Hart / UNDP

pines is the leading country in the Asia-Pacific region in promoting agroforestry systems," says Katie Friday, Associate Pacific Islands Forester for the US Forest Service.

Even social welfare programmes in the South have caught the eye of agencies in the North. "The developing world has learned to tackle their social problems on a shoestring," says Marion Ritchey, Regional Director of the Inter-American Foundation (IAF), a US government-funded development agency. "For too long, throwing money at a problem has let us believe that professional degrees and fancy infrastructure can solve our social service ills. We have much to learn from the South about setting up low-cost self-help efforts that build self-esteem."

The IAF sponsored Leonardo Escobar, an emissary from the Fundación Servicio Juvenil, the Youth Services Foundation in Colombia, to come to the US for two years. The purpose was to study how US public and private agencies deal with homeless people, abandoned, runaway or abused youths, and users of addictive drugs. "The problems of crime, drugs, alcoholism and homelessness are identical in Bogota and Washington, DC," says Mr. Escobar. "The only difference is that the drugs in the US cost more."

But 30-year-old Mr. Escobar soon discovered that there were also underlying differences in the way the two cities tackled their difficulties. The Youth Services Foundation in Colombia combines education, vocational training and a boarding facility which allows the children complete freedom to come and go when they want.

"Here," says Mr. Escobar, "the push is to get kids in and out of court-chosen correctional institutions, and then back to their families or foster homes. There is little concern for changing the root of the difficulties facing young people."

Mr. Escobar has been able to impart some of his insights to social workers and administrators, psychologists, law enforcement officers, and social development policy-makers in nine US cities. He recommends that social workers have face-to-face talks in communities to find out people's most pressing needs, instead of devoting so much time to merely compiling facts and figures and tending to bureaucratic requirements.

Giving people the means to help themselves — as opposed to offering charity or welfare — is one of the simplest, most powerful ideas to emerge from developing countries. Muhammad Yunus of Bangladesh began a credit movement in the 1970s that has turned the banking industry on its head. His Grameen Bank in Bangladesh offers small loans averaging about $70 to the poorest of the poor, usually women who use the cash to fertilize a field, buy a milk cow or start a small cottage business.

Today, the Bank has 900,000 borrowers and annually disburses $100 million in loans. Its success has inspired banks, community groups and non-profit organizations in Canada, the US and Europe to provide credit to people with little or no collateral but plenty of sound ideas for launching their own small enterprises.

If the minds of such developing world innovators as Dr. Yunus had not been so widely tapped, creative solutions to many pressing world problems might never be found. Indeed, if researchers had never looked South for ideas, the curative power of the rosy periwinkle might have remained forever in Madagascar. The zeolite catalyst may never have left India. And the latest attack on London's underground problems might still be stalled. ■

RECONSTRUCTION

NICARAGUA

Nicaragua: Giving Peace a Chance

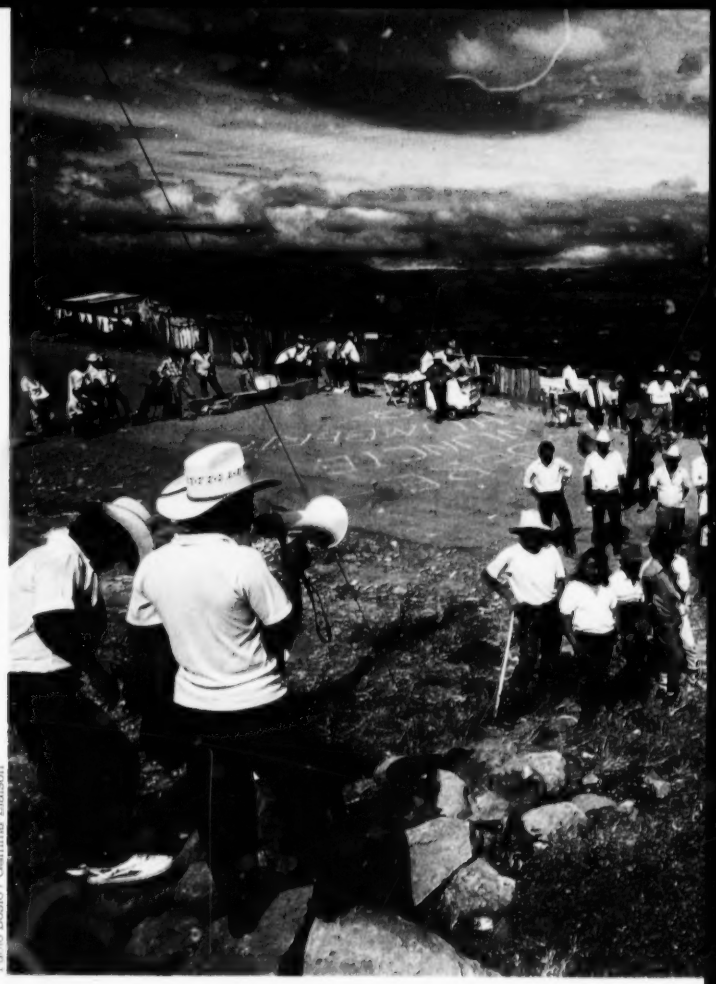
Paolo Bosio / Getmtta Liaison

A year ago last June, Contra commanders turned in rebel weapons to UN supervisors.

New development efforts aim to help both resident Sandinistas and resettled Contras

By Eric Weiner

Pantasma, Nicaragua — In this dusty village perched on the foothills of Nicaragua's northern mountains, the fighting that disrupted daily life for the past eight years has ended. But the war's legacies linger on. A field laced with unexploded land mines adjoins Pantasma's main street. The fence surrounding the field has torn open, allowing cows — and occasionally



Paolo Bosio / Gamma-Liaison

Ex-Contras protesting lack of jobs and housing in the Raan region.

children — to wander into it, with predictable results.

More than a year after peace has come to Nicaragua, the nation is still healing wounds from the eight-year civil war that literally pitted brother against brother. For the returning Contras, the road home has been a long and frustrating one. After President Violeta Barrios de Chamorro was elected last year, members of the ragtag Contra army, most of them ill-clothed peasants, agreed to a cease-fire. They turned over their arms, dismantled their camps in Honduras and returned home, having been guaranteed safety and priority treatment in land distribution. But jobs are hard to find in Nicaragua's anaemic economy. According to the UN's Economic Commission for Latin America and the Caribbean, 61 per cent of the population lives in extreme poverty. Many former rebels have become disenchanted; some are talking of taking up arms again.

"These people lived their lives on the run, armed and fighting," says Francesco Vincenti, the United Nations Development Programme's (UNDP) Resident Representative. "How do you take a refugee and a rebel and turn him into a normal citizen?"

That question reverberates in every corner of Nicaragua, from the plywood slums of Managua to the tin roofs that dot the peasant villages here in the mountains. For the past year, an estimated 100,000 displaced people have received emergency assistance from such agencies as the Organization of American States (OAS), and the United Nations High Commission for Refugees. That aid is winding down, and is scheduled to end with the August harvest.

In turn, overseas donors are shifting from short-term aid to long-term development projects.

Indeed, new life is being breathed into development projects in a country where war had all but paralyzed such work. "The situation here has been so volatile it's been nearly impossible to start a development programme," says Mr. Vincenti. But today, new projects range from a revolving credit scheme for farmers to the repair of roads long neglected during the war.

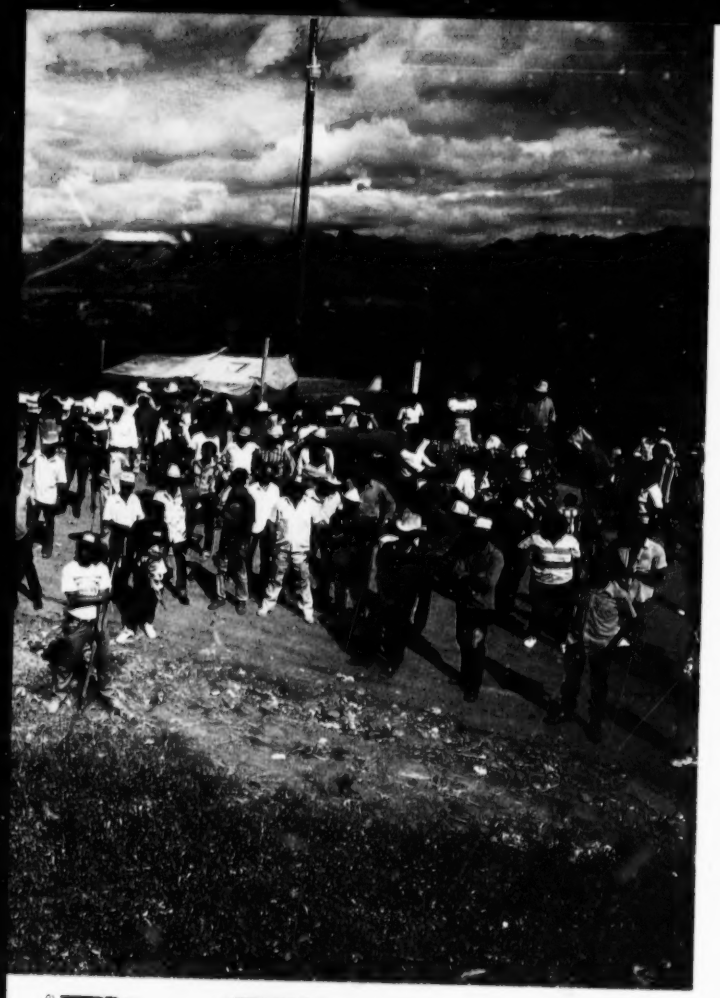
Most UNDP technical assistance is aimed at helping former rebels and their families make the transition from fighters to farmers. Of the US$16 million that UNDP will spend in Nicaragua in 1991, more than a third is earmarked for projects that directly benefit people displaced by the war.

Pantasma is typical of a village in need of such aid. More than 150 ex-Contras have recently settled in this town of 750, and now they find themselves living side-by-side with Sandinista officials, their former enemies. Few ex-Contras have found jobs and adequate housing. "I've lived in Nicaragua all my life," says Noel Rodriguez Aráuz, who recently returned from a rebel camp just north of here. "But now I can't even find work."

Mr. Aráuz and his family, which includes seven children, live in a flimsy three-room house. They receive 11 kilogrammes of rice a month from a relief programme sponsored by the OAS. But Mr. Aráuz says the food isn't enough to feed his family and, with much regret, he is considering leaving Nicaragua to try to find work elsewhere.

At the general store, a back table serves as a meeting room for the former combatants. A common complaint heard is that Sandinista officials still hold a firm grip on power and that, as a result, aid is not fairly distributed. A concern shared by all is how to root out the mines that have already killed two cows and cost a child her right leg.

The centrepiece of all resettlement efforts is *Prodere*, a $90 million Central American programme funded



Raoul Shade

According to a UN survey, 61 per cent of Nicaraguans live in extreme poverty.

by the Italian government and administered by UNDP. In Nicaragua, *Prodere* has allocated close to $25 million for new schools, hospitals and homes and is providing health care, education and agricultural assistance. The programme, which is only now achieving visible results, has already reached as far as Pantasma. *Prodere* recently opened a two-person district office here and has just completed funding a nearby rural clinic.

In addition to administering *Prodere* funds, UNDP is sponsoring a $2 million revolving credit plan for small farmers, enabling them to buy tools, seeds and other supplies. It's the first programme of its kind in Nicaragua. "These people would never get a bank loan on their own," says Jacqueline Hartvelt, a UNDP official who oversees the programme in New York. "They are too poor."

The eight-year civil war crippled Nicaragua's economy, with many factories forced to shut down. *Prodere* is breathing new life into these abandoned businesses; it is already helping restore a coffee plantation that has been neglected for the past six years because it lay in the heart of the battle zone.

While Nicaragua's civil war caused little physical damage — the countryside is not marred with bombed-out buildings, for instance — it has nonetheless had a profound effect on this small nation. Although the Contras numbered only 20,000, another 85,000 family members were uprooted during the war, some seeking a haven in Honduras. Perhaps as many as another 200,000 Nicaraguans fled the war zone when they found themselves caught in the cross-fire.

"You cannot expect the economy to absorb them in its current state," says

Mr. Vincenti. Indeed, the task facing Nicaragua's recently elected president is daunting. The nation is saddled with many inefficient state-owned industries and owes nearly $11 billion in foreign debt.

The new government has taken several steps to improve the economy. President Chamorro issued a new currency, the *Cordoba Oro*, or gold Cordoba, which is pegged to the United States dollar and backed by a monetary stabilization fund. A blueprint to rehabilitate the nation's infrastructure — roads, ports, airports and buildings — is also being drawn up. But with the country virtually bankrupt, foreign aid is crucial for the time being. The United States has pledged $300 million in assistance, more than any other single nation.

That kind of aid can't come soon enough for Clifford Biblu, one of about 30 ex-Contras who lives in Wawabir, a fishing village along the Caribbean coast. He recently returned home after seven years in the mountains of Honduras and northern Nicaragua. "I'm glad I'm alive," he says, displaying a scar that runs the length of his arm. But like most former rebels, Mr. Biblu has yet to find steady work. And, like many colleagues, he still fears retribution from his former foes.

Indeed, tensions between Contras and Sandinistas, who held power until last year, still run high. The flash point for that conflict is land distribution — what Mr. Vincenti calls the "powder keg of the country." That's not surprising in a nation whose livelihood depends on agricultural products such as coffee, cotton, beef, rice and beans.

Many people who lost land when the Sandinistas came to power are now trying to reclaim it, bogging down the country's legal system with complex land-ownership cases. While some progress has been made in redistributing land, the OAS estimates that 5,000 displaced Nicaraguans still need plots to farm.

Occasionally, land disputes flare into violence. Recently four farmers were killed in Jinotega Province when about 250 men, women and children walked into a Sandinista Co-operative with the intention of negotiating farming rights for part of the land. They were met by 20 armed workers, who opened fire.

Ironically, Nicaragua, with a population of only 3.8 million, is sparsely populated and much of its soil is fertile. This lush country, agricultural experts say, could be the region's main grain producer. Still, a basic quandary remains: How can a development project benefit one group of Nicaraguans — the refugees and displaced people — without fueling resentment from others? In Nicaragua, several precautions are taken. Local mayors are involved in deciding who gets aid; all recipients are carefully screened. And while *Prodere's* funds are channelled into regions with large numbers of displaced people, the programme's new schools, clinics and improved roads benefit others in the community as well.

Yet nobody is under the illusion that further reconciliation in this fractured country will be either quick or easy. In Pantasma's general store a group of ex-Contras talked of setting up roadblocks to protest their plight. Besides more food and better health care, they say they have an even more pressing demand: mine-detection equipment so that their children and livestock can finally roam free. ■

Raoul Shade

A Jinotega billboard promotes the new currency issued in March to help curb inflation.

Pakistan Forest Institute

Silkworm larvae at the Pakistan Forest Institute thrive on mulberry leaves.

AGRICULTURE

Twilight of a Tradition

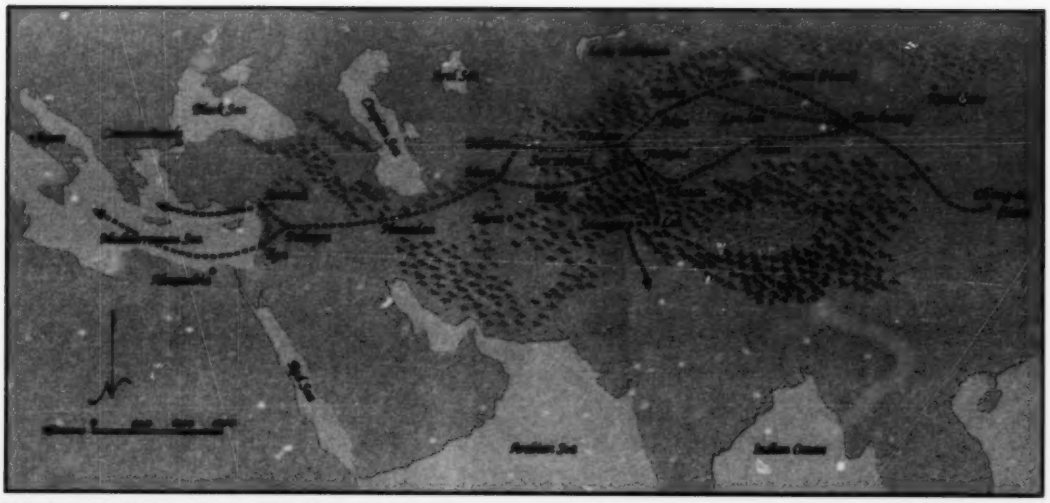
Pakistan's new silk industry could put an end to the old caravan trade

By Andrew Boner

Peshawar, Pakistan — For tens of centuries, caravans carrying Chinese silk have wound their way westward into Pakistan. Through the Khunjerab Pass they have come, between the mountains of the Karakoram and Himalaya ranges, and along the valleys of the river Indus. From the backs of yaks and the humps of camels to the modern motorized convoys, they are as traditional and as unrelenting as Pakistan's historic demand for silk.

But now moves are underway to try to end Pakistan's dependency on these caravans. The Pakistan Forest Institute (PFI), with assistance from the United Nations Development Programme (UNDP) and the Food and Agriculture Organization of the UN (FAO), has developed new lines of indigenous silkworms and higher yielding mulberry bushes on which to nurture them. Efforts are also underway to develop the silk producing capabilities of the Pakistanis.

PFI hopes its efforts eventually will generate regular employment for 15,000 families, or up to 75,000 people, through the development of sericulture in Pakistan. "A lot of emphasis can be placed on women's participation in this industry," says Iqbal Ahmed, Director of Sericulture at PFI and himself an amateur silk weaver. "Silk production is a labour-intensive industry that involves a lot of delicate work. Women can be trained in all stages of the process from



Map drawn by Kathleen Borowik, (© 1982 Metropolitan Museum of Art) for the exhibition "Along the Ancient Silk Routes: Central Asian Art from the West Berlin State Museums."

rearing to reeling to weaving, all of which can be done in the home." This is an important consideration in many of the rural areas of Pakistan where it is said that a woman only leaves the house three times during her life: once for her wedding, once for her father's funeral, and finally for her own.

But launching the industry means starting almost entirely from scratch. Even the limited amount of silk previously produced in Pakistan came from imported hybrid silk seed, or eggs. "Prior to the development of our own parent lines, sericulture in Pakistan relied primarily on silk seed imported from China, Japan and Korea," says Dr. Kwang Ei Park, a silk egg breeding expert from Korea, and Chief Technical Adviser to the sericulture project at PFI. "This dependence costs the country US$4.5 million of foreign exchange annually." In order to protect their export markets these countries refused to sell the pure lines which are crossed to produce the higher yielding hybrids.

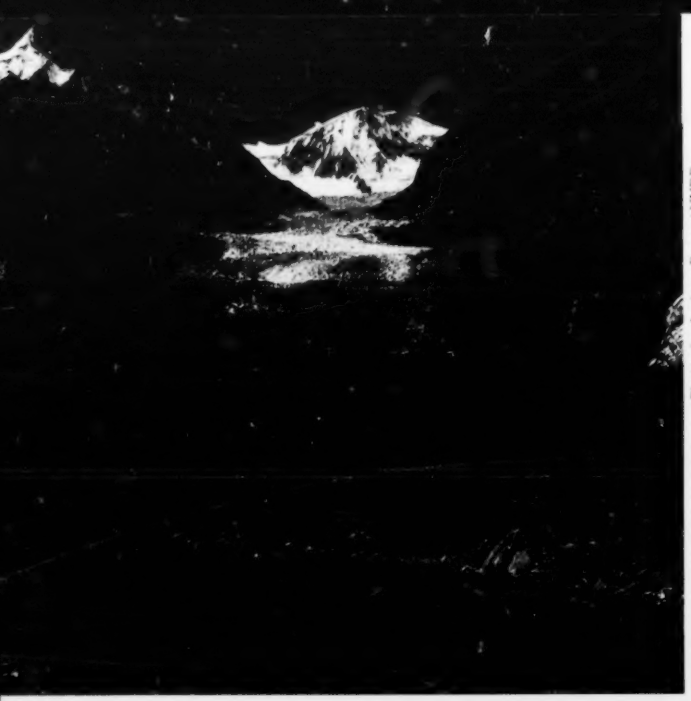
The research to develop pure lines of parent stock began at PFI in the autumn of 1984. Starting with imported hybrids from China and Japan, several generations of silkworms were reared. From each generation, silkworms were selected for further breeding according to the characteristics they displayed. Egg colour, cocoon shape and quality, larval markings, and hatching ratios are among the criteria for selection. Through the generations, the sought-after characteristics become increasingly stable until no further variation occurs.

But before the silk can be extracted from the cocoon, the silkworm must be killed. Consequently, a country's capacity for the production of silk is limited by the availability of eggs produced by crossing two lines of locally evolved parent stock. These eggs are called F1 hybrid silk seed, and "yield a very high quality cocoon compared to the parent stock," says Dr. Park.

Raw silk comes from fresh cocoons that have been dried in a machine for up to six hours at temperatures between 60°C and 100°C. The worms die and are removed. "In China, they make a cooking oil from the dead larvae," Dr. Park notes with a smile, "but it hasn't been marketable in Pakistan." Instead the Pakistanis feed the dead larvae to their chickens.

With the worms removed, the cocoons are sorted and the damaged ones discarded. They are then soaked in warm water to loosen the threads, reeled, and re-reeled into wheels of raw silk ready for weaving. It takes nine kilogrammes of fresh or green cocoons to produce one kilogramme of raw silk. On one hectare of mulberry bushes, a farmer can raise enough silkworms to produce 750 kilogrammes of green cocoons a year, which will yield a profit of $900.

The ready availability of F1 hybrid silk seed makes it possible to rear silkworms three to four times a year rather than only once in the spring. While it is hoped that the additional supply of silkworms will eventually be able to satisfy Pakistan's appetite for silk with-



Photos by Andrew Bauer / UNDP

Pakistan's Karakoram Highway follows the ancient silk route beside the Pasu glacier.

out help from abroad, the appetites of more immediate concern to Dr. Park are those of his silkworms.

Silkworms are picky eaters. "They feed exclusively on mulberry leaves," explains Dr. Park. "Since the project started we have been exploring ways to improve the efficiency of our mulberry leaf yields." Through a series of spacing, pruning and fertilization experiments undertaken at PFI, leaf yields have increased by more than 100 per cent.

Although the research at PFI gives Pakistan the know-how required to meet its own demand for silk, it will be some time before the country can satisfy the nation's demand for 750 tonnes of silk yarn each year. Locally produced supplies currently meet only 20 per cent of this demand. The rest is either legally imported or smuggled into the country. Smuggling deprives the government of $25 million a year in customs revenues.

"The demand and the potential are there like a door waiting to be opened," says Muhammad Mateen-ud-Din, the UNDP programme officer in charge of the project. "What is required is a conscientious effort to apply the research to production."

Toward that end, UNDP has helped to establish two silkworm breeding facilities in Jammu and Kashmir. One is for the production of commercial silk seed, and the other for the multiplication of the parent stock. In time it is hoped they will also serve as distribution outlets for farmers interested in rearing silkworms.

But the extent to which sericulture can be expanded in Pakistan rests largely on the priority the government gives to the project and its success in stimulating private interest. On the commercial front, the news is encouraging. More than 200 farmers have been trained, including six women, in various breeding and production techniques since the project started in 1984. "This year we distributed over a million mulberry bush cuttings to private farmers," says Mr. Ahmed. "Loans and subsidies for farmers interested in sericulture are also being made available."

Project officials fret that silk production in Pakistan is still perceived as only a minor cottage industry. This perhaps explains the reticence, so far, of the federal government to employ civil servants to take over operation of the project when the foreign experts depart. "Without adequate numbers of trained government staff, the breakthroughs in sericulture research at PFI will, at best, be less effectual," says Mr. Mateen-ud-Din.

"The Sericulture Department is one of many at PFI, and actually we are given a relatively low priority when it comes to funding," says Mr. Ahmed. He estimates that to effectively extend the research to rural communities the project needs another $2 million, more than twice the amount already spent.

As the potential for silk production increases, so does the need for a reliable quality control system. "The quality we have achieved at PFI is very high," says Dr. Park, "every bit as good as what we get from the imported silk seed. What we don't have yet is a systematic organization for quality control, and that becomes a problem when we want to extend the project to the private sector." A centralized quality control unit at PFI, which would grade the quality of the silk and regulate production techniques, has been proposed by the Sericulture Department.

Researcher Siraj-ud-Din inspects trees around the Forest Institute's mulberry plantation.

Opportunities for export could flourish shortly as the labour-intensive silk industry becomes too costly for the Japanese and Koreans. Perhaps ahead of itself, Pakistan has already exported 20 egg-layings of its parent stock for multiplication experiments in Nepal. "Self-sufficiency in silk production is still a dream," says Mr. Mateen-ud-Din, "and I would not like to speculate on a time-frame for that dream." ■

UNV Michiko Mineno examines a four-day-old Vietnamese baby at the Whitehead detention centre.

Scant Hope in Sight for Vietnamese Asylum Seekers

By I. Rajeswary

UN Volunteers provide medical care and counselling in Hong Kong's refugee detention centres

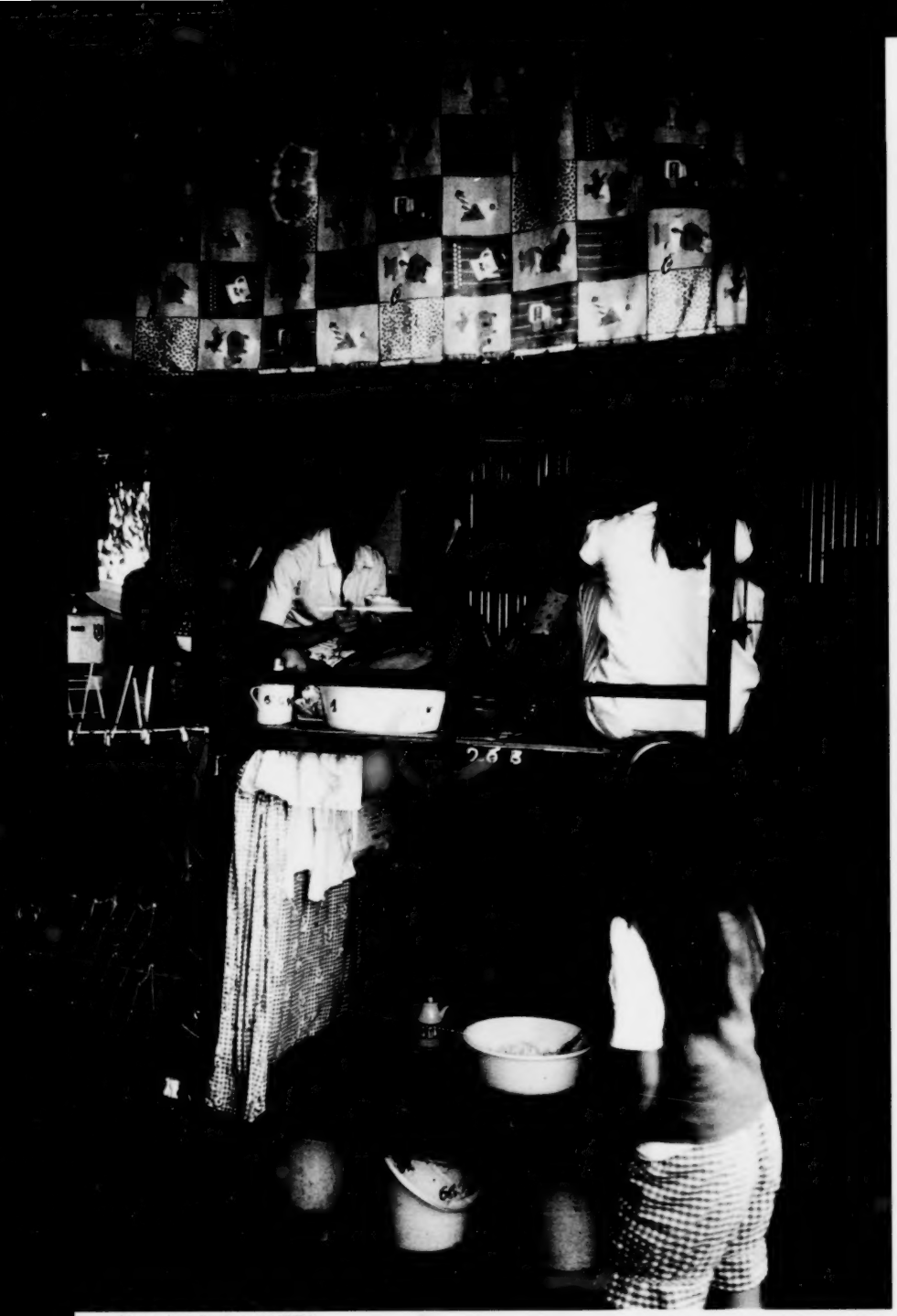
Hong Kong — United Nations Volunteer (UNV) Michiko Mineno gently examines the navel of a four-day-old screaming Vietnamese infant for signs of infection. She is assisted by two Vietnamese health workers. The mother underwent caesarean surgery to deliver the three-kilogramme baby. This is her first post-natal visit to the clinic at the Whitehead detention centre, the largest holding area in Hong Kong for Vietnamese asylum seekers.

Ms. Mineno, who is from Japan, had worked as a nurse at Tokyo's Women's Medical Hospital where she was used to the most modern facilities. Here, the examination room at the detention centre is crammed with a desk and chair, a bench for waiting patients, a weighing scale, a small examination table and cardboard boxes full of medical supplies and toiletries. The linoleum-covered cement floor is cold and sticky. There is no sink and no familiar smell of antiseptic agents. The stench from rotting garbage and public latrines pervades the area. Vietnamese children, their fingers curled around the bars of the solitary window, peer into the room, shutting out the sunlight.

Through an interpreter, Ms. Mineno learns that the woman, who is in her twenties, had been raped in Viet Nam and discovered she was pregnant when she arrived in Hong Kong. She has no husband, friends or family — no one to help wash her surgical wounds or bathe the baby. "I have been working here for 10 months," says Ms. Mineno, "but cases like this still upset me." She is one of eight UNVs providing care and counselling in Hong Kong's detention centres.

Ms. Mineno jots down the woman's particulars and requests that health workers visit mother and child in their bunk in a nearby warehouse where she lives with 249 other asylum seekers. The woman is but one of 61,000 Vietnamese asylum seekers in Hong Kong's 10 detention centres anxiously waiting while others decide whether they will be free to emigrate to other countries — or forced to return home.

Almost 7,500 have opted for repatriation. Nearly all have exhausted life savings to flee Viet Nam across the South China Sea hoping for a better life, only



Photos by I. Rajeswary / UNDP

to languish in prison-like conditions in squalid camps and detention centres that dot the British colony.

Until 16 June 1988, the so-called Vietnamese "Boat People" who landed in Hong Kong were granted asylum and treated as refugees and entitled to be resettled in such third countries as Australia, Canada, the UK and the US. But after June 1988, Hong Kong authorities began screening new arrivals to separate refugees from those who came for other, perhaps economic reasons. Since then, only those who have a well-founded fear of persecution back home are granted refugee status.

Despite the screening process, 18,446 asylum seekers journeyed to Hong Kong in 1988, almost six times more than in 1987. Alarmed by the influx, the government declared that after 16 June 1988, non-refugees should volunteer to return to Viet Nam or face "mandatory repatriation." The new policy was put into practice six months later when 25 adults and 26 children were awakened in the predawn hours, herded onto a bus and forced aboard an aircraft that flew them back to Hanoi. Due to an international outcry, the plan was suspended indefinitely.

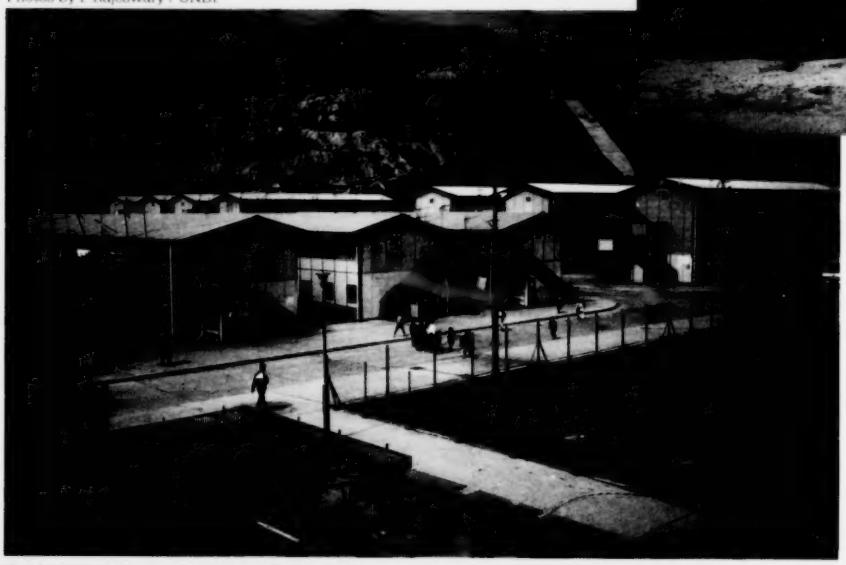
Hong Kong does not force boat loads of refugees back out to sea, as has occurred in Malaysia and Thailand. As a result, many residents complain that asylum seekers from China who illegally cross the border into Hong Kong at the rate of 40 a day are routinely sent back, while Vietnamese are allowed to stay.

In fact, the rising flood of Vietnamese asylum seekers has proved to be a heavy burden on Hong Kong — both economically and politically. With six million people crammed into 1,062 square kilometres, the island colony is desperately short of space. Those accorded refugee status live in "open" camps in the New Territories and Kowloon. They are spared the high barbed wire walls typical of detention centres. They are free to come and go, and many find jobs in the colony, a sore point among Hong Kong residents who resent the presence of refugee camps in their neighbourhoods and feel that the Vietnamese are taking away their jobs.

Hong Kong also supplies asylum seekers food and toiletries costing over US$20 million a year, with the understanding that it will be reimbursed by the UN High Commissioner for Refugees (UNHCR). However, UNHCR has fallen behind in repayments due to a shortage of contributions from govern-

The gates are slammed shut as soon as Vietnamese children return from school.

Photos by I. Rajeswary / UNDP



Refugees may come and go at the centre in Pillar Point.

ments. The agency, together with 10 local and international non-governmental organizations, funds its own assistance programme for refugees in Hong Kong. This year's requirements, including the payment to the government, are up 23 per cent to $43 million.

According to Robert Van Leeuwen, UNHCR's chief of mission, of the current 61,000 Vietnamese in detention centres and refugee camps, 5,142 arrived before 16 June 1988 and therefore enjoy automatic refugee status. Of those that followed, only 5,500 were adjudged refugees, while 16,000 failed to qualify after thorough screening. "Those classified as non-refugees," says Mr. Van Leeuwen, "have no choice but to return to Viet Nam."

To persuade them to return, UNHCR has a team of 18 counsellors, including UNVs Wenilia Sederiosa, 35, from the Philippines and Tomoko Fujisaki, 30, from Japan. Ms. Sederiosa is attached to the Shek Kong detention centre, a cluster of 300 large army tents pitched on an unused military runway near the

Vietnamese at the Shek Kong centre live in army tents.

border with China. Here she conducts briefings on voluntary repatriation. Last December, 15 Vietnamese from her centre volunteered to return. In January this year, 34 persons came forward. "Some volunteer because they are homesick," says Ms. Sederiosa, "but many do so because they have given up hope for a better life."

Ms. Fujisaki says gaining rapport is essential in winning the confidence of the Vietnamese. Her duty station is in the Hei Ling Chau detention centre, which holds 2,557 asylum seekers. "Their experience in Viet Nam has taught them not to trust authority," she says, "and most of them see us as working with the Hong Kong authorities to 'get' them repatriated."

In December 1988, the Hanoi government signed a memorandum of understanding with UNHCR stating that it will not persecute those who return voluntarily. However, amnesty does not extend to those already facing criminal charges. "A number of people have returned knowing full well they will be

jailed for criminal offenses and not illegal departure," says Mr. Van Leeuwen.

Since 1975, some 7,500 Vietnamese asylum seekers elected to go home. To ease their return, UNHCR gives $50 for an adult and $25 for a child upon their departure from Hong Kong. After their return to Viet Nam, they are each given $30 every month for a year, as well as housing aid and special supplements for needy families.

Yet Boat People continue to arrive in Hong Kong. In January this year, Hong Kong was obliged to find shelter for 430 new arrivals. New births average 2,000 a year and are on the rise in all detention centres due in part to the mistaken belief that children born in Hong Kong will be entitled to stay.

The only way to stop the refugee flow, say officials, is for conditions inside Viet Nam to improve, which means lifting the US-led economic embargo. Recently, the British government warned that forced repatriation may resume to stem the exodus.

UNHCR, not wanting to become a deportation agency for any government, continues to advise non-refugees to leave, but with little conviction that persuasion alone will work. "Unless people can be assured of the basic right to an adequate standard of living for themselves and their families," says Thorvald Stoltenberg, the former High Commissioner for Refugees, "no amount of counselling will persuade them to return."

In June, almost 4,000 Vietnamese asylum seekers turned up in Hong Kong. They include some who were coming for the second time, having earlier been voluntarily repatriated. UNV Ms. Sederiosa says counselling is becoming more and more stressful as the pressure for repatriation mounts.

"It is only a matter of time before the Vietnamese will have to go back," she says. "They know it, too. But it does not make caring for them any easier." ■

From balancing books to saving babies

Hong Kong — A desire to see the world and experience its diverse cultures prompted accountant Michiko Mineno to sign up as an international volunteer in 1979. Her first assignment was to balance the books on a supplementary feeding project for Cambodian refugees in Thailand. It was also the turning point in her life. Ms. Mineno, then 26, decided to switch vocations and become a nurse.

"For the first time," she recalls, "I saw a two-year-old child weighing only six kilos. He was so weak he could not even sit up." What shocked her even more, she says, was the fact that it was the mother's ninth child. "The already weakened mother was still trying to breast-feed her baby when she had no milk in her breasts."

Putting aside her ledgers, Ms. Mineno stepped back to watch as nurses fed the baby, teaspoon after teaspoon of soup, to nurture him to health. "I decided then," she says, "that healing people was more rewarding than juggling figures."

Returning to Japan, Ms. Mineno enrolled in a three-year nursing course at the Shinjuku Nursing School in Tokyo. She spent another two years specializing in midwifery and joined the Obstetrics and Gynaecology department of the Tokyo Women's Medical University Hospital. "I assisted doctors in prenatal examinations and taught nutrition and health education," she says. "I also helped deliver babies."

But Ms. Mineno wanted to work with refugees. She joined the UN Volunteers, a programme administered by the United Nations Development Programme (UNDP), as a nurse. She was posted to Hong Kong in April 1990 to manage a clinic for Vietnamese children, pregnant women and young mothers, and to promote health education at the Whitehead detention centre.

After the modern comforts of the Tokyo Women's Medical Hospital, the centre was a shock. Over 22,000 Vietnamese, two-thirds of whom are women and children, are huddled in three-tiered bunks in warehouses made of aluminium. Her senses were assaulted by mounds of feces and garbage strewn outside the warehouses. There was no running water. She also saw head lice and scabies for the first time. "It was a stressful first month," she recalls.

Ms. Mineno also had to deal with her own anger and frustration. Coming from a middle-class home, she thought the food given to the Vietnamese — small pieces of fatty meat and peas — far from adequate. "I kept my emotions in check," she says, "by reminding myself that I was a UN Volunteer and my purpose was to improve their quality of life, not to create trouble."

UNV Michiko Mineno

She channels her energy toward running the clinic and launches personal hygiene campaigns in the camp. She worries incessantly about possible outbreaks of cholera. She constantly, but gently, tells her patients to keep clean. "They are very sensitive people," she says, "and have been subjected to enough indignity already."

Today, there is a waiting line outside the clinic set up under the auspices of Save the Children Fund, a non-governmental organization. Two trained Vietnamese health workers assist her with record-keeping and examination. Children run up to her for quick hugs as she walks around the detention centre. "It took some time to reach them," she says, "but it was well worth it." — **I.R.**

ECONOMY

Booming Tourism, Explosive Exports

By Emma Robson

Port Louis, Mauritius — Just over a decade ago, this tiny nation of islands and rocky shoals in the Indian Ocean turned to the International Monetary Fund for help in overcoming a pile of economic woes. The country was plagued by high inflation, mounting debt, soaring unemployment and growth so slow that it barely kept pace with its population. In the early 1980s Mauritius agreed to embark on a "structural adjustment programme," then a new invention of the World Bank that consists of reining in spending, making sweeping policy changes and stimulating growth.

While dozens of other countries have since tried similar cures with mixed results, when diligently applied to Mauritius, the approach produced a stunning turn around. In the last seven years, the Mauritian economy has grown a brisk five per cent a year. Since 1975, the country's per capita GDP has tripled to nearly US$2,000.

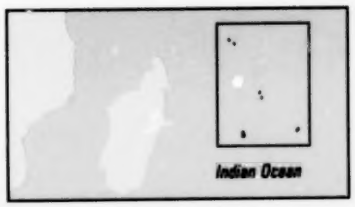
The country's rapid recovery has prompted many observers to describe it as an "economic miracle," a term which most Mauritians, however, disclaim. "We decided what needed to be done: diversify away from sugar," says Maurice Paturau, Chairman of the Joint Economic Committee, a forum representing all major industries and government. "And we worked hard at it."

Mr. Paturau is also quick to point out that being small is an asset. Almost all the Mauritian population of one million lives here on the main island, an area about the size of London. This physical closeness, coupled with good road and telephone links, helps enhance the intimacy that exists between government and business. This healthy partnership, which embraces a motley array of ethnic voices — Indian, Chinese, European and Creole — helps ensure a balance of interests in national planning and decision making, and enables new initiatives to be implemented swiftly.

Besides diversifying away from sugar, the country needed to create jobs, contain inflation and reduce its yawning budget deficit. In the late 1970s and early 1980s, more than 20 per cent of the workforce was idle. Inflation was running at 30 per cent, and a sharp decline in the price of sugar, which at the time represented nearly one-quarter of the country's gross domestic product, forced the treasury deep into debt.

The government addressed these problems by clamping down on public and private sector wages, cutting spending and devaluing the Mauritian rupee, which was making imports too cheap and exports too expensive. It promoted tourism aggressively by negotiating new air routes to Africa, Asia and Europe, and opening up Mauritius to foreign investors to build luxury, low-rise hotels designed for the affluent tourist. To boost agricultural revenue and cut food imports, it offered sugar producers incentives to branch out into value-added special sugars, exotic flowers and vegetables. Most importantly, it opened up the country to foreign investment in a new industry that appeared to offer promising foreign

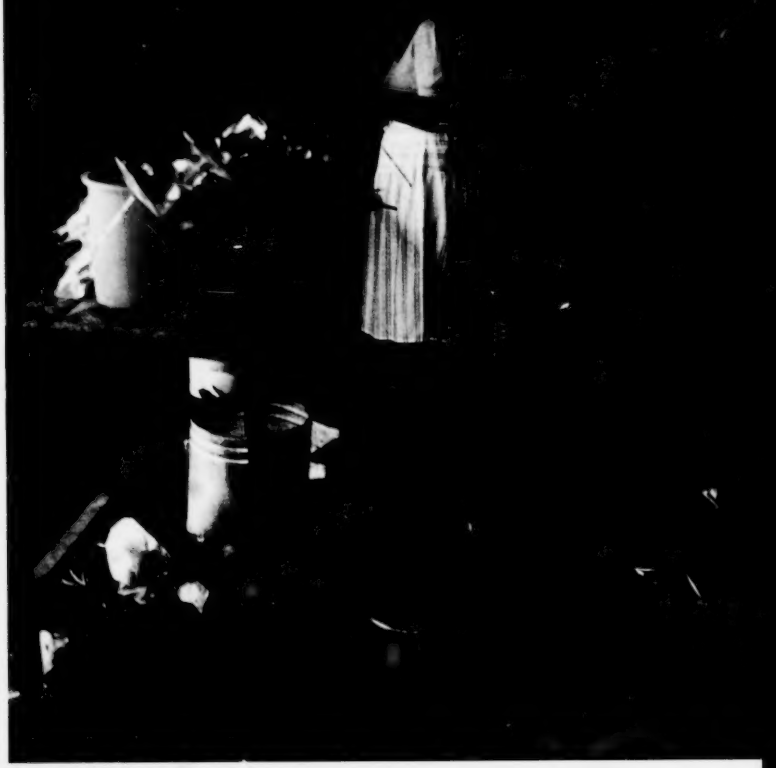
White sand, turquoise seas make Mauritius a major tourist attraction.



MAURITIUS

Photos by Emma Robson / UNDP

Farming vies with new industry for scarce land on Mauritius.



Sugar producers are now branching out into flowers that are sold in Europe.

Mauritius prolongs its economic miracle

exchange prospects: textile and garment manufacturing.

Having identified potential industries, Mauritius sweetened the investment terms of its dormant Export Processing Zone, set up a one-stop shop to handle all foreign investment paper work, and started peddling the country's attractions in Europe, North America and Asia. Manufacturers in the free zone pay a modest 15 per cent tax on corporate profits, can freely repatriate profits and capital, and are exempt from duty on imported equipment. There are no limits on ownership of Mauritian-based companies or on ownership of land. Yet over 40 per cent of the new manufacturing industries are nationally owned, a fact that Mauritians are most proud of.

"These incentives are attractive, but not so different from what countries like Taiwan and Singapore were offering," says Chandrakumar Sheebah, manager of the investment promotion division of the Mauritian Export Development and Investment Authority (MEDIA). "What made Mauritius especially attractive was cheap labour." While soaring demand for labour has since pushed up wages, Mr. Sheebah estimates that Mauritian manufacturing labour costs are still as little as one-sixth of those of the Republic of Korea, Singapore, or Taiwan and one-tenth of costs in the United Kingdom.

Mauritius offered several other advantages over the longer-established export processing zones of Southeast Asia. Mauritians are bilingual in French and English, their country's two official languages. They have long excelled in business out of a tradition of trading. By developing country standards, they are well-educated. Many study abroad and have acquired good management skills.

Perhaps the biggest attraction to investors was the nation's special relationship with the 12 countries of the European Community (EC). Under an agreement negotiated by the United Kingdom, which ruled Mauritius prior to independence in 1967, the island has enjoyed preferential trade rights with the Community since Britain's entry in 1973. By setting up manufacturing businesses in Mauritius, investors from countries outside the EC can export to the European market without being subject to quotas and tariffs.

In its early efforts to attract foreign capital, Mauritius was also blessed by good timing. It began marketing its Export Processing Zone at a time when Hong Kong investors were becoming wary of the transfer of the British crown colony to Chinese rule in 1997. In their search for safer havens, many shifted capital into Mauritius, often in joint ventures with local counterparts. Hong Kong-based corporations are now the largest investors in the island.

In 1983, the Mauritian economy took off as a flood of foreign money began pouring into manufacturing and hotels. Factories producing fashion garments and knitwear for export to the US and Europe mushroomed, vying for space with the sugar cane plantations that cover half the island. Foreign investment rose from less than $700,000 in 1980 to more than $43 million in 1989, fueling a manufacturing boom that leapt by more than 30 per cent a year between 1983 and 1987, slowing to 12 per cent thereafter. Annual tourist arrivals have grown three-fold since 1982 to nearly 300,000 a year, creating thousands of new jobs.

Seven years of robust growth have put more money in all Mauritian pockets. On the palm-shaded golden sands of Grande Baie in the north of the island, 24-year-old beach hawker Jean-Marc Valentin makes an average of $215 a month selling pearl necklaces and sarongs to tourists, who come mainly from Europe and South Africa. The salaries of all Mauritians have nearly doubled and living standards have taken a major leap forward.

Tax revenues have also soared, enabling the government to spend liberally on social services. Health care and education are free and rapidly improving. Heavily subsidized housing is provided to low-income families. The average life expectancy has risen to 69 from 65 in just 10 years. Mauritius is one of the few developing countries to rank in the top third of UNDP's Human Development Index, which rates countries on life expectancy and literacy, as well as income.

"All Mauritians are better off these days," says André Bourdet, a 40-year-old storekeeper of a sugar estate, who recently splurged on a long vacation in Europe. The Bourdets own a car and a handsome whitewashed bungalow with a garden. Like many Mauritians, they also have a video recorder. "People have to work harder," says Mr. Bourdet, "but life is more comfortable and we save more."

Just how much longer Mauritius can sustain the good life is a question much debated these days by economic planners. Recessions in parts of Europe and the US, the island's major markets, cloud export prospects. Rising labour costs are fanning inflation, now at above 10 per cent, and eroding the traditional edge Mauritius enjoyed on other manufacturing free zones. Environmental concerns are keeping new construction at bay.

"Just to retain workers, we have to offer incentives that were unthinkable only a few years ago," says Raymond Hardy, manager of Highlands, a medium-sized sugar estate. "Employees get free transportation to and from work, rental subsidies, paid sick leave, and 14 days paid vacation." In order to discourage staff from switching to other companies, Floréal, the island's largest shirtmaker, owned by a Mauritian group, sells electrical household equipment to employees at wholesale prices and recently started a sports club and in-house newsletter.

Many companies like Floréal have already begun a major shift away from quantity towards quality. "Once we made cheap, plain shirts and plain

Teachers are being retrained to teach more vocational subjects.

Photos by Emma Robson / UNDP

Floréal, the island's largest shirtmaker, is producing higher-priced lines.

white sugar," says Mr. Paturau. "Now we make expensive, high-class shirts, special brown sugars and grow anthurium flowers," which are popular in the US and Japan.

Quality is a major concern of the government planners, too, who see the island's future growth depending on higher value, more capital-intensive products. They have targeted informatics, electronics, the production of computer software, French and English language publishing and offshore banking as new growth areas. Workers are expected to move to these industries from the sugar plantations, which are saving on labour costs and time through mechanization, and from the textile factories as they shed staff in their shift from quantity to quality.

All the labour-saving devices in the world, however, will not solve the country's employment squeeze in the short-term. Ministry of Planning economist Esther Hanoomanjee says that with the population, now at one million, expanding at a scant 0.8 per cent a year, if the economy maintains its recent growth, the country will be short of 20,000 to 30,000 workers by the year 2000.

To expand the labour pool and upgrade the skills of existing workers, the government has drawn up a human resources masterplan. Financed by the United Nations Development Programme (UNDP), the plan includes reform of the education system. Its current overly academic approach to teaching is blamed for the system's large number of drop-outs. Nearly 60 per cent of children go to secondary school, but of these, only one-quarter complete their final year.

In 1991, 1,000 of the estimated 7,000 annual secondary school drop-outs began training in a range of skills provided by a newly established Industrial Vocational Training Board. Women with few skills are branching out into areas such as fashion and footwear design and jewellery production. At the same time, teachers are being retrained in the new educational system, which offers practical subjects and pays special attention to slow learners.

To support the human resources plan, UNDP organized a donor conference in 1990 at which $300 million in grants and loans was pledged by the African Development Bank, the World Bank and the Governments of Australia, France, India and the United Kingdom. Most of these funds have been earmarked for vocational training centres.

Most observers are confident that with careful planning and further hard work, Mauritius can continue to fuel its boom. "We should achieve annual growth of five per cent a year," says Mr. Paturau, "but we'll have to work much harder." ■

ENVIRONMENT

LESOTHO

Taming Highland Waters

By David Kinley

Tiny Lesotho takes on an environmental challenge

Bokong Ha-Kennan, Lesotho — Just a few years ago, this scattered settlement in Lesotho's rugged northern highlands was barely accessible by Land Rover. Today, giant Caterpillar earthmovers are carving up steep hillsides to make way for modern highways. New roadside shops and trading posts are springing up to supply thousands of workers housed in sprawling trailer camps. And high atop a rim overlooking a deep gorge cut by the Malibamatso River, a suburban-style development is rising, replete with ranch homes, sidewalks, streetlights and a comfortable visitors' lodge.

The flurry of construction is all part of Africa's largest water diversion scheme, the Lesotho Highlands Water Project (LHWP). Begun in 1986, the LHWP involves building five major dams, hundreds of kilometres of highways and tunnels and an underground hydro-power plant over a 30-year period. The first phase alone, comprising the 182-metre-high Katse Dam and a 48-kilometre transfer tunnel, will begin delivering over 1.5 million cubic metres of water per day to South Africa in 1996. Even now, long before the US$20 billion project is completed, it is irrevocably altering Lesotho's economy, culture and ecology.

Tapping water for hydropower is designed to make Lesotho self-sufficient in energy. It will also earn the landlocked country of 1.6 million people up to $80 million a year in royalties on the water piped to South Africa. At a time when earnings from miners working in South Africa are stagnating due to automation, the project offers the potential to spur new employment-creating industries and make the country more attractive to foreign investors and tourists.

But critics, from local church groups to global environmentalists, claim that current links with South Africa, including Lesotho's heavy dependence on Johannesburg for foreign exchange, would be dangerously deepened. They claim, moreover, that like many large-scale dam projects in the developing world, the LHWP will impose sizeable social, economic and environmental costs on those who can least afford them, particularly Lesotho's poor herders and farmers. Endangered species of plants and animals may be threatened, they fear. Important archaeological sites will be inundated by the rising waters of giant new reservoirs.

"There have been inconsistencies in the way displaced people are being compensated," says Baba Jordaan, a Methodist minister who has helped to organize the Highlands Church Action Group based in Maseru, the capital. "Officials don't have satisfactory answers to many of our questions about compensation, hiring practices and the environment," he says. As hundreds more construction workers and their heavy equipment move into the highlands, the debate is bound to grow.

The unique partnership that has given birth to the LHWP is, in itself, enough to raise controversy. The Highlands Project was forged in 1986 out of a treaty between South Africa and

A 182-metre-high dam will be built here across the Malibamatso River.

Lesotho's newly-installed military government. Financing is being provided by the World Bank, the European Community, the African Development Bank, the South African government and private banks. Project contractors — many of them South African firms — are supervised by the World Bank in concert with the government's new high-level agency, the Lesotho Highlands Development Authority (LHDA).

Precisely because of mounting local concerns over the project, the highlands scheme has become one of the most heavily scrutinized water projects ever. "Lesotho's treaty with South Africa clearly states that the project must be executed to the highest international engineering and environmental standards," says Jonathan Jenness of LHDA's Environment Division, standing in the midst of a small library filled with design and appraisal reports. He leafs through the pages of one such document, a 190-page "Compensation Plan" for over 2,000 affected residents around the Katse Dam site. "We will try to ensure that anyone displaced or losing their livelihood is not worse off," he says. "Our long-term aim is to raise living standards through ecologically sound rural development."

But that is no easy matter in a country that is visibly one of the most eroded areas in the world. "The whole region is extremely overgrazed and already heavily degraded," reports environmental specialist Dale Jenkins in a recent evaluation for LHDA. Despite advance planning, fundamental uncertainties remain. "Erosion and sedimentation rates are the most important environmental indicators in the area," says Mr. Jenkins "They're critical to effective watershed and reservoir management. Yet there is virtually no valid information on past and present rates."

Environmentalists working with LHDA admit that they are running hard to keep up with the breakneck pace of construction. "Some of the roads built in the project area had serious errors in design and construction," says LHDA ecologist Jack Hennessy, "and the result is unnecessary environmental damage." Mr. Hennessy is surveying a hillside near the Katse Dam site where a bulldozer is feverishly tearing up the ground. "The critics," he adds, "are being handed powerful ammunition."

After a slow start-up, LHDA's ecology team now scrutinizes specifications in every tender document to ensure compliance with rigid environmental standards. Resettlement, rural development, water supply and sanitation programmes promised as part of the LHWP package are now being painstakingly negotiated with the villagers at the affected sites. "Almost 20,000 people will be directly affected by the loss of land in the Katse catchment area," says Mr. Jenness. "We are carrying out an elaborate consultation involving every household, every chief and every district administration to ensure that these programmes have community backing."

Biological survey teams from the LHDA are currently studying endangered plants and animals and developing plans for relocating the nests of endangered species like the bald ibis, which will be disturbed by construction work. A 1,000-hectare biological reserve — the first of three planned — is being created near the top of the Katse watershed at an altitude of over 3,000 metres. It will provide a refuge for species of Lesotho's rare African alpine ecosystem.

Despite these new environmental provisions, making sure that they are carried out requires intensive field-level monitoring. This is an area where LHDA still is lacking in manpower, money and expertise. "A lot more money is needed to rehabilitate hillsides damaged during road construction," says Dr. Malefane Maema, an environmental officer working with LHDA. "And a lot more monitors should be out at the construction sites to keep on top of the contractors."

Some help is already in the pipeline. With a special grant from the United Nations Development Programme (UNDP), the LHDA's Environment Division is getting the added expertise it needs in settling land disputes and promoting rural development, fisheries and small enterprises for people uprooted by the project. In addition, several dozen indigenous non-governmental organizations (NGOs) are being enlisted to participate in LHDA's far-reaching "environmental awareness campaign."

"By co-operating with the LHDA, the NGOs can help mitigate the social and environmental effects of the Highlands Project," says Moeketsi Masilo, manager of LHDA's Environment Division. "These organizations are also the key to providing the public with information about the project."

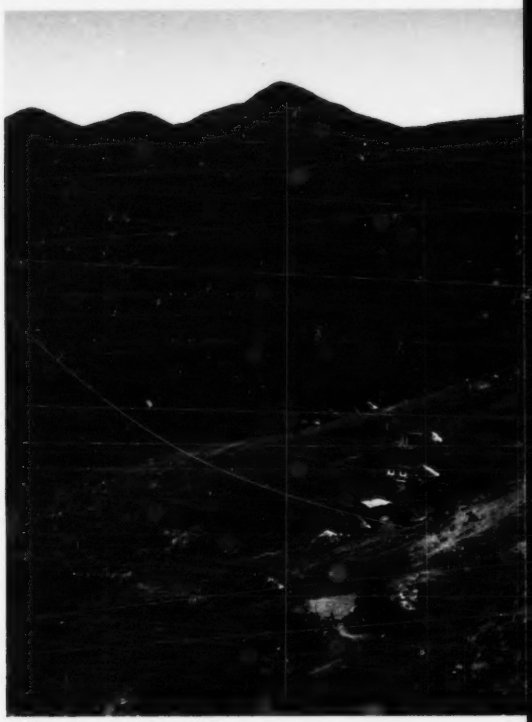
Up to 40,000 highlands people will ultimately have their lands, homes or incomes directly affected by the LHWP. "South African mining is the principal source of income for most people in the highlands, supplemented by farming and livestock," says Mr. Hennessy. "When the mine workers start coming back, they are going to graze more cattle and boost soil erosion even further."

Lesotho is overstocked with cattle by at least 100 per cent already, according to the calculations of Mr. Jenness. "Comprehensive land-use plans need to be implemented to meet fuel and fodder needs in an ecological manner," he says. "Training must also be provided to develop new livelihoods in fisheries, tourism and other viable rural industries."

As they attempt to enforce environmental guidelines while also being responsive to rural communities, the

officials of LHDA are walking a tightrope. "We've got to modify the blueprint continually," says Mr. Jenness. "But we're encouraged that the church groups, NGOs and communities are now helping to shape the agenda."

Some argue that they have no choice. "The agreement that launched the LHDA in 1986 is final," says Sister Veronica, a nun who works with the Highlands Church Action Group. "The best thing we can do is influence the project to minimize the damage to our people — especially the poor." ■



Lesotho's highlands are rugged and sparsely populated.

Photos by David Kinley / UNDP

When the Katse reservoir is filled, the water level will rise almost to the top of this new bridge.

PROFILE

Maneka Gandhi

India's First Green Politician

By Christopher McIntosh

New Delhi, India — For years, while India's forests were decimated and the air and water grew more polluted, most politicians continued to treat the environment as a marginal issue. That was until Maneka Gandhi came on the political scene three years ago.

As "India's first green politician," Mrs. Gandhi has become the Joan of Arc of the environmental cause. It is largely due to her efforts that the movement is now on the offensive and Indian politicians no longer relegate ecological matters to the sidelines.

Inevitably she made enemies. Some call her arrogant, impetuous, and accuse her of obstructing progress. But such accusations are at least one measure of her persistence in asking awkward questions and opposing powerful interests when they threaten the environment.

Mrs. Gandhi is the widow of Sanjay, younger son of the late Prime Minister, Indira Gandhi. Eight years after Sanjay's death in an air crash in 1980, his widow was elected to Parliament at the second attempt. She was 31. By then she had become a passionate environmentalist.

"I started thinking about the kind of future that my 10-year-old son Feroz would have," she explains. "We try to teach our children moral virtues, but what about their right to life and health, to clean air and water? I realized that most of us just don't look at the fundamental issues, such as the way we produce and consume energy. So I spent four years reading and learning about ecology."

In 1990 she was made Minister of State for Environment and Forests in the government of V. P. Singh. She introduced rigorous pollution-testing for cars, initiated plans for cleaning up India's rivers and devised a bold system of environmental courts that would have the power to impose penalties on polluting factories. After six months, however, she resigned, protesting that her policies were being blocked by her senior minister, Nilmani Routray. When the Singh government fell, she returned briefly to office under Chandra Shekhar at the end of 1990, until his government in turn came to an end early this year.

Whether in or out of office, Mrs. Gandhi will go on fighting to keep the spotlight on environmental issues. "You see the way this building is designed," she says, standing in the quiet inner courtyard of her house in a New Delhi suburb. "There was a time when most private houses were built like this, with a cool space in the centre. When I was a child no one needed fans or air-conditioners. Now there are hardly any houses like this left. New houses and apartment blocks are built in the European or American style, warmer inside than outside. So air-conditioners are everywhere, and much more energy gets squandered."

Energy, Mrs. Gandhi points out, is central to the whole environmental issue. Take the problem of methane gas in the atmosphere, which contributes to the greenhouse effect. Rice is a major producer of methane, because it ferments through contact with the water in which it grows. "Yet India is switching to rice from wheat," she says. "Why?"

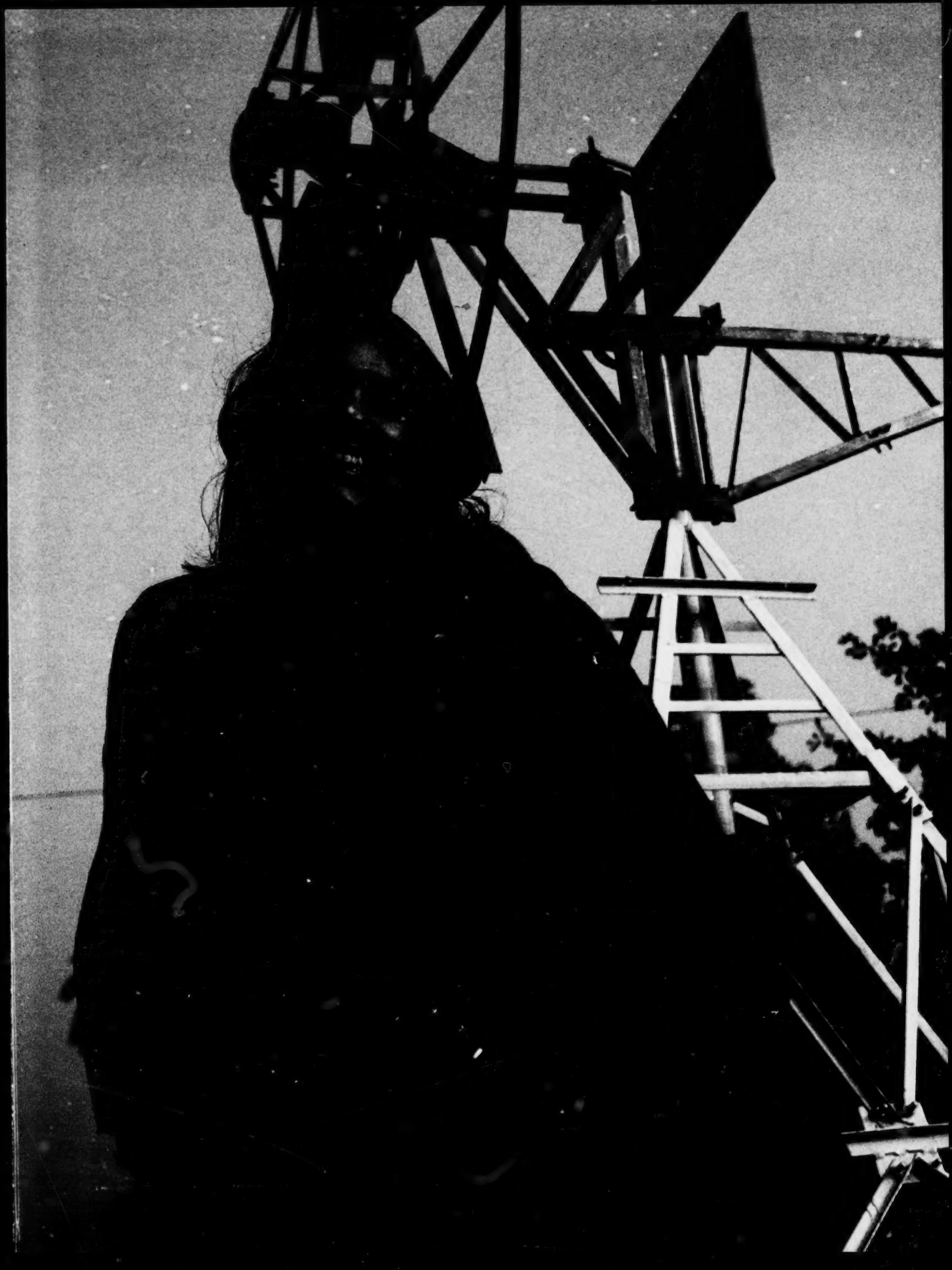
"As India's forests are depleted," she continues, "the average Indian rural woman spends over eight hours a day gathering fuel. Coming home exhausted, she wants to spend as little time as possible cooking. So, instead of making the traditional wheat-based *chapatis*, she cooks rice, which is much quicker. As a result, more and more land goes under rice cultivation. What's more, women in this situation tend to have more children to help them fetch and carry."

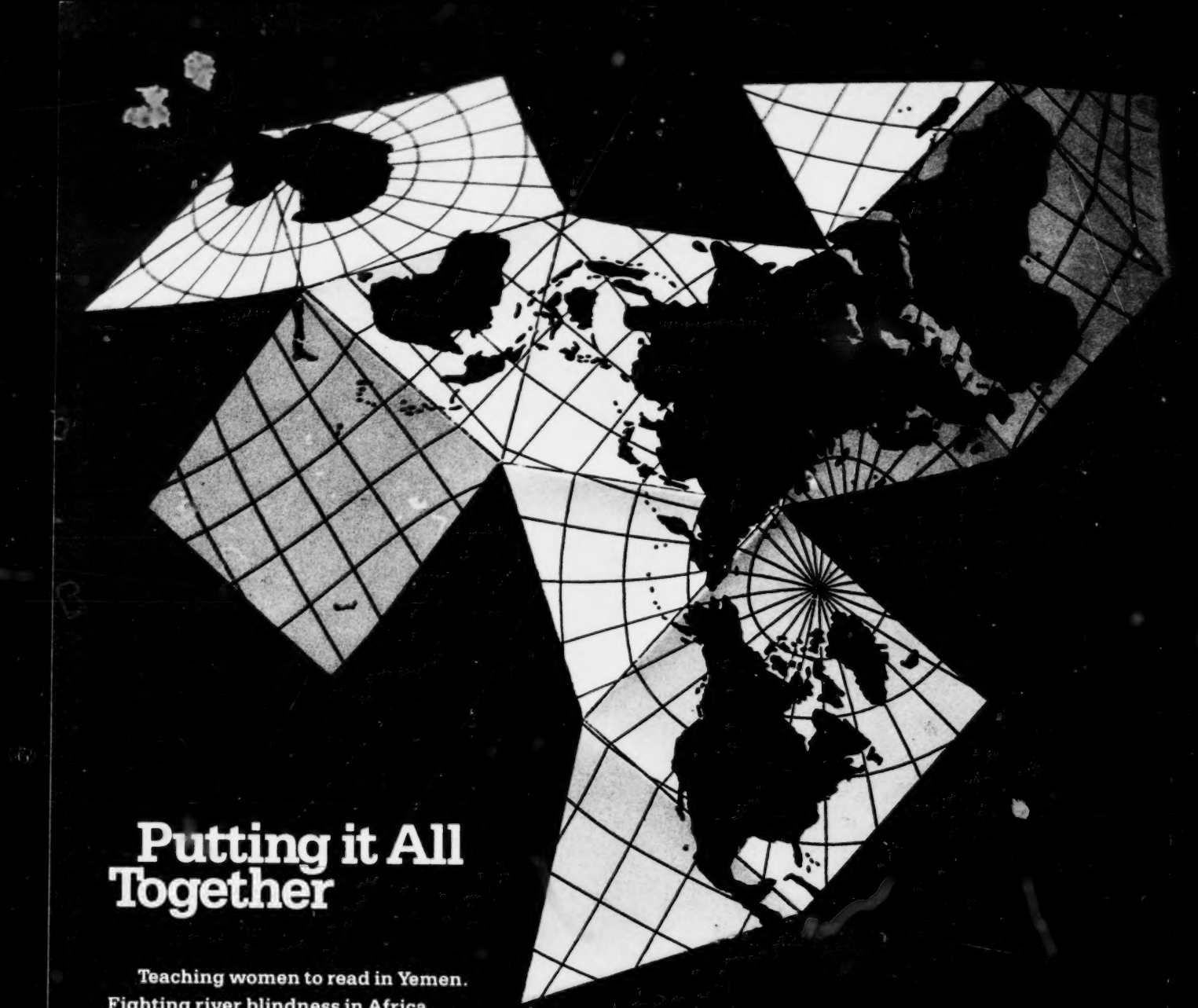
A law should be passed, Mrs. Gandhi says, insisting on a fuel plantation for every village, such as in Kerala, in south India, the only state in the country where villagers have easy access to firewood. One consequence is that there is an average of less than two children per family.

On the subject of electricity generation, Mrs. Gandhi has strong views. "Advocates of conventional energy say that a generating plant can produce one megawatt for 100 rupees, whereas it would cost 200 rupees using solar power," she says. "But this is based on a very limited system of auditing that leaves out the invisible costs."

Such hidden costs, she adds, include compensation for people displaced when a power station is built, the price of putting up pylons and cables, the loss of power in transmission, the interest on capital expenditure. When all this is added up, she says, the true cost of a megawatt produced in a conventional generating plant is nearer to 500 rupees.

"The environment should not be treated as an isolated issue," Mrs. Gandhi emphasizes. "It cannot be restricted to environment ministries. It has to be dealt with at every level of decision-making — business, commercial, industrial and developmental." ■





Putting it All Together

Teaching women to read in Yemen.
Fighting river blindness in Africa.
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Joining international action against AIDS.
Planning a city in Cyprus.
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